

ADF Aviation Oxygen Maintenance and/or Storage Facilities – Design and Construction Requirements

Technical Authority : Directorate of Technical Airworthiness – ADF
Subject Matter Expert : Officer-in-Charge Aircraft Maintenance Processes, Technologies & Standards

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References

- a. AAP 7002.023 *Oxygen General, General and Technical Requirements*
- b. AAP 7055.001-99 *Liquid and Gaseous Dry Breathing Oxygen Maintenance Instructions*
- c. AAP 7550.001-2M *Oxygen Equipment*

Introduction

1. Aviation Dry Breathing Oxygen (DBO) is used in military aircraft for protection of crew members and passengers against the effects of hypoxia at cabin altitudes above 10 000 feet, and against the inhalation of toxic materials which may be present in the aircraft in an emergency. There are four means of providing Aviation DBO:

- Gaseous Dry Breathing Oxygen (GDBO),
- Liquid Dry Breathing Oxygen (LDBO),
- Chemical Oxygen Generators, and
- On-Board Oxygen Generation Systems (OBOGS).

2. Aviation DBO systems introduce hazards into the maintenance environment. Oxygen increases material flammability and LDBO can cause cryogenic burns. Meticulous attention to quality of both systems and the DBO supplies is essential to minimise the risk of fire or contamination of supplies. Exacting standards of cleanliness of oxygen systems in aircraft, ground maintenance facilities and replenishment equipment is vital. Maintenance practices also require special procedures to ensure cleanliness levels are preserved and hazards to personnel are minimised.

3. The purpose of this document is to promulgate the minimum requirements for the design of ADF aviation facilities for:

- maintenance of cryogenic and/or gaseous equipment used in oxygen and nitrogen distribution systems for ADF aircraft, and
- storage and dispensing of cryogenic fluids and/or store oxygen and nitrogen replenishment trolleys containing Extra High Pressure (EHP) gaseous cylinders.

4. The design and safety criteria detailed in this document are in addition to the requirements of the:

- *Occupational Health and Safety (Commonwealth Employment) Act 1991,*
- *AS 1894 (Storage and Handling of Non-Flammable Cryogenic and Refrigerated Liquids),*
- *AS 4326 (The Storage and Handling of Oxidising Agents), and*
- *AS 4332 (The Storage and Handling of Gases in Cylinders).*

Cryogenic and Gaseous Aviation Equipment (Oxygen and Nitrogen) Maintenance Facilities

5. AAP 7002.023 Section 4 details the minimum requirements for a maintenance facility which is designed for the servicing and repair of cryogenic and gaseous aircraft equipment used in oxygen and nitrogen distribution systems.

Aviation Dry Breathing Oxygen (DBO) Storage Facilities

6. AAP 7002.023 Section 4 specifies the minimum requirements for aviation DBO storage facilities, including cryogenic fluid storage tanks containing LDBO, or as EHP gaseous cylinders containing GDBO located on oxygen charging trolleys. Also, AAP 7002.023 Section 4 specifies the minimum requirements for gaseous Nitrogen trolleys dedicated for purging oxygen systems.

7. The requirements detailed in AAP 7002.023 Section 4 are to apply to all aviation DBO storage facilities, where it is intended that:

- cryogenic fluid (LDBO) supplies are kept and dispensed to mobile equipment (500 gallon Tankers and 50 gallon Dispensers) or portable containers (Aircraft LDBO Converters and LDBO Samplers) for its eventual use in aircraft or dispatch to an applicable laboratory for analysis;
- oxygen charging trolleys containing GDBO EHP gaseous cylinders are kept; and
- oxygen charging trolleys containing GDBO EHP gaseous cylinders are stored temporarily during the working day.

Aviation Oxygen Gas Reticulation System

8. AAP 7002.023 Section 4 lists the components and materials to be utilised in the construction of an aviation oxygen gas reticulation system and provides a basic schematic for such a system.

Aviation Nitrogen Gas Reticulation System

9. AAP 7002.023 Section 4 lists the components and materials to be utilised in the construction of a aviation nitrogen gas reticulation system and provides a basic schematic for such a system.

Oxygen Clean

10. All oxygen distribution equipment and maintenance facilities components shall be 'Oxygen Clean'. 'Oxygen Clean' components shall be cleaned and tested in accordance with AAP 7055.001-99 (preferred), or cleaned and tested vide a procedure that has been qualified against the following Non-volatile residue (NVR) and particulate requirements, and approved by DGTA-AMPTS:

- NVR shall be less than 3 mg/ft² (33 mg/m²). The test for this shall be ASTM F331 "Standard Test Method for Non-volatile Residue of Solvent Extract from Aerospace Components (Using Flash Evaporator)" or equivalent.
- Particulate levels shall be determined by processing in accordance with ASTM F311 "Standard Practice for Processing Aerospace Liquid Samples for Particulate Contamination Analysis Using Membrane Filters" and counting using ASTM F312 "Standard Methods for Microscopical Sizing and Counting Particles from Aerospace Fluids on Membrane Filters" or SAE ARP 598B "Determination of Particulate Contamination in Liquids by the Particle Count Method R(1991)." The levels shall meet the limits specified in the table below.

Particle Size Range (µm/100mL)	Number of Particles Allowed
X > 175	0
100 ≤ X < 175	1
50 ≤ X < 100	5
X < 50	Unlimited (Providing the NVR test requirements are met and there is no silting)
Fibres (length greater than 50µm and a length-to-width ratio of 10 to 1 or greater)	5

11. All components used in aviation nitrogen gas reticulation systems, where the aviation nitrogen gas reticulation system is used in the maintenance of aviation oxygen equipment, shall be Oxygen Clean. The use of aviation oxygen compatible items in nitrogen gas reticulation system is preferred for standardisation with aviation oxygen gas reticulation systems.

Further Guidance

12. The information detailed within AAP 7002.023 is to be used in concert with the oxygen instructions contained in AAP 7055.001-99 and guidelines provided in AAP 7550.001-2M. Any queries regarding the minimum requirements are to be directed to the sponsor of this document.

Contact Officer

OIC AMPTS DGTA-ADF
RAAF Williams
LAVERTON VIC 3027
Telephone: 03 9256 3581 Fax: 03 9256 3363